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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

CHICAGO 16, ILLINOIS

GAS ABSTRACTS

MARCH, 1954

VOLUME 10, NUMBER 3

AFFILIATED WITH

ILLINOIS INSTITUTE OF TECHNOLOGY

CONTENTS

1. Gas Industry 37
2. Appliances 38
3. Combustion and Industrial Furnaces 39
4. Carbonization and Gasification 40
5. Natural Gas and Natural Gas Condensates 43
6. Petroleum and Synthetic Liquid Fuels 47
7. Analytical Methods and Tests 49
8. General and Physical Chemistry 50
9. Organic Chemistry 52
10. Chemical Engineering 53
11. Process Equipment and Instrumentation 55
12. Materials of Construction 56

GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $18.00 per year to U.S. addresses; $22.00 foreign.—Printed in the U.S.A.

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1. GAS INDUSTRY

Canadian Gas

Yorath, D. K. ALBERTA DEVELOPMENT DOMINATES CANADIAN SCENE. *Gas Age*, 113, 52, 53, 95 (1954) January 14.

The author reports 1953 developments in proposals to transport natural gas from "Canada's Texas" into a majority of homes between the St. Lawrence River and the Pacific Ocean, with a possibility of exports to the U. S. Provincial reserves are estimated at 11.5 trillion CF.

A. E. Neumann

Court Ruling's Effects

COURT APPROVAL OF PRICE FIXING TO CURB GAS SALES. *World Oil*, 138, 45-46, 48 (1954) January.

A discussion is presented of the confusion and probable effects on the natural gas industry due to the U. S. Supreme Court's refusal to review the decision of the Circuit Court of Appeals in the Phillips Petroleum Co. case.

H. C. Owen

Employee Education

Oates, J. F., Jr. EXPLAINING THE RATE CASE TO THE EMPLOYEE. *Public Utilities Fortn.*, 52, 686-689 (1953) November 5.

Methods used by The Peoples Gas Light and Coke Company of Chicago, Illinois, to keep its employees informed about matters of general company interest are discussed. Of special significance is the monthly editorial in the company's employee magazine, which is written by the chairman, Mr. James F. Oates, Jr., and which has earned a wide acceptance among the employees. One of these messages published recently is included. In it, Mr. Oates explains the reasons which caused the company to ask for a general rate increase. H. C. Owen

Microfilm Records

Freel, E. T. SAVE SPACE, MONEY AND MANPOWER. *World Oil*, 138, 49-50 (1954) January.

The functions and scope of the microfilming cameras have been greatly expanded in the past several years. They are now an increasingly important tool in a wide range of office operations and record-keeping methods. Dual-lens cameras have recently been developed which record exactly the images on both sides of a record in one operation, cutting copying work in half. An important development in filing is a card and index system which, by the insertion of strips of film in narrow die-cut slots of a card, provides folder-type filing. Marginal indexing and color coding make for ease in locating and segregating of records on a single subject or related groups. C. A. Simms

Peak-Load Gas

Pettyjohn, E. S. IGT PROGRESSING IN SEARCH FOR SUBSTITUTE NATURAL GASES. *Gas*, 30, 46, 47, 49 (1954) January.

This article summarizes the problems in substituting manufactured for natural gases as a means of meeting peak loads, and briefly reviews research at the Institute of Gas Technology, Chicago, directed toward production of substitute natural gases from natural gas condensates, oil, and coal. A. E. Neumann

Pure Water

Schwob, C. E. FEDERAL WATER POLLUTION CONTROL ACT. *Ind. Eng. Chem.*, 45, 2648-52 (1953) December.

A review of the policies, administration, and enforcement of the Federal Water Pollution Control Act. The act was enacted in June 1948. Systematic control of nationwide water supplies will become increasingly important as industrialization increases. W. G. Bair

Rate Decisions

Parker, L. T. DECISIONS ON RATE-MAKING REVIEWED. *Amer. Gas J.*, 179, 23, 37 (1953) December.

A review of recent court decisions important to the growing body of precedent in rate-making. Among the decisions reviewed, the following examples may be cited: The United States Supreme Court held that a gas rate may be reasonable although it fails to produce an adequate return to the gas company, owing to the fact that business has not developed sufficiently to be remunerative, or that the plant

is on a larger scale than justified by the demand. The question of whether a public service commission may increase gas rates without determining present earnings and future propertine earnings of the gas company was answered in the affirmative by a higher court.
R. F. Bukacek

2. APPLIANCES

Appliance Sales

Adams, F. H. INDUSTRIAL GAS AT THE CROSSROADS. *Am. Gas Assoc. Monthly*, 35, 29-32, 56 (1953) December.

A statistical article comparing the shipments of gas ranges, gas water-heaters and heating, with those of electricity in 1953.
J. G. Chalcraft

Aerated Burners

Minchin, L. T. DEVELOPMENT OF THE LOW-PRESSURE FULLY-AERATED BURNER. *Gas World* (British) 138, 1315-16 (1953) November 21.

A critical discussion on popular beliefs concerning aeration in gas burners. The low pressure, fully aerated "Schwank Burner" is described and its applications discussed in detail.
M. Quinn

Burners

Reich, O. (assigned to J. Vigniti) GAS BURNER AND FLOW RESTRICTOR. U. S. 2,662,590 (1953) December 15.

Swenson, P. F. and Pravda, M. F. (assigned to The Cleveland Research Corp.) VARIABLE OUTLET GAS BURNER. U. S. 2,664,153 (1953) December 29.

Zink, J. S. and Reed, R. P. RADIANT GAS BURNER ASSEMBLY. U. S. 2,667,213 (1954) January 26.

Burner Controls

Hanson, H. L. (assigned to Minneapolis-Honeywell Regulator Co.) BURNER CONTROL APPARATUS. U. S. 2,662,591 (1953) December 15.

Mueller, E. M. GAS CONTROLLING VALVE. U. S. 2,667,325 (1954) January 26.

O'Keefe, D. P. GAS STOVE CONTROL PANEL. U. S. 2,661,732 (1953) December 8.

Heat Transfer In Cooking

Dunning, E. W. HEAT TRANSFER AND THE COOKING PROCESS. Gas Council Res. Comm. GC12 (1953) November.

This paper attempts to arrange the varied cooking processes in a systematic manner so that general heat transfer theory can be applied. Original experimental work has been described, much of it of an exploratory nature, and suggestions are made for future experimental work.
J. G. Chalcraft

Ignition

Ebeltoft, W. H. (assigned to Minneapolis-Honeywell Regulator Co.) BURNER AND COAXIAL FLAME ROD ASSEMBLY. U. S. 2,665,749 (1954) January 12.

Massier, J. (assigned to Servel, Inc.) ELECTROCATALYTIC GAS IGNITER. U. S. 2,667,605 (1954) January 26.

Racek, A. and Raganitsch, J. GAS IGNITER. U. S. 2,661,616 (1953) December 8.

LP-Gas vs Electricity

Beveridge, E. and McCracken, E. C. COMPARATIVE UTILIZATION OF ENERGY BY HOUSEHOLD ELECTRIC AND LIQUEFIED PETROLEUM GAS RANGES, REFRIGERATORS, AND WATER HEATERS. U. S. Dept. Agriculture Techn. Bull. No. 1073 (1953) October.

This bulletin gives an interesting comparison of LP-gas and electric appliances. The introduction states that these tests were made to give up-to-date unbiased information for the consumer, however "research was conducted by the Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture, under a 'cooperative agreement' with the National Electrical Manufacturers Association".
E. F. Searight

Pressure Regulator

Hart, C. W. GAS REGULATOR. U. S. 2,661,601 (1953) December 8.

Test Burners

Gilchrist-Davey, W. J. RECENT INVESTIGATIONS OF BRAY JETS—II. *Gas World* (British), **138**, 1308-10, 1313 (1953) November 21.

A continuation of Part I (*Gas World*, **138**, 400 (1953) giving data for plots of gas pressure versus the roar point, the lift point, the incipient lift point, and the extinction point.

M. Quinn

Space Heating

TURN ON THE HEAT. *Construction*, **35**, 66-67 (1953) November.

Article describes several types of space heaters applicable on construction jobs. Thermal capacities of the various units are quoted. A simplified equation for approximation of space-heating costs is given. M. Quinn

Ventilation

Bennett, W. J. and Purkis, C. H. EXPERIMENTS WITH COMMON BALANCED FLUES. Gas Council Res. Comm. GC13 (British) (1953) November.

This paper describes work on the common balanced-flue system of ventilating gas appliances. Such a method combines many of the advantages of common flues and individual balanced flues, and has been considered especially for use with heaters fitted in multi-stories blocks of flats. After a brief description in Section II of the present methods of flueing heaters in the above type of building, the common balanced-flue system is described, and Section III gives an account of the technical problems met with in the advancement of the idea. Section IV describes three installations erected at Watson House, upon which work was carried out with the object of solving the problems outlined in Section III. The results of the experimental work described in this Section are tabulated in Appendix 2. In Section V recommendations are made for a 10-storied installation, based upon the Authors' experience of the laboratory set-ups. The calculations made in the design of the system are given in Appendix 3. In Appendix 1, a theoretical approach is produced, which may be used as the basis of future design work.

Authors' Abstract

3. COMBUSTION AND INDUSTRIAL FURNACES

Air Pollution

CHICAGO BOARD OF EDUCATION SMOKE PROBLEM. *Coal-Heat* **66**, 36-38 (1953) December.

Cooperation between the Chicago Dept. of Air Pollution Control and the Dept. of Plant Engineering of the Chicago Board of Education with its 441 schools has helped to reduce the dustfall in the city from 390 tons per sq mi per month to the present-day 57 tons. Comments are given on the human and technical factors.

O. P. Brysch

Burning Velocity

Kurz, P. E. INFLUENCE OF HYDROGEN SULFIDE ON FLAME SPEED OF PROPANE-AIR MIXTURES. *Ind. Eng. Chem.*, **45**, 2361-66 (1953) October.

The inhibitive influence of H_2S, in additive amounts and also as a secondary fuel, on the burning velocity of hydrocarbon-air bunsen type flames is discussed. Experimental procedure, apparatus, and results are given with a possible mechanism of inhibition by H_2S.

M. Quinn

Diffusion Flames

Holland, B. H. THE STRUCTURE AND STABILITY OF FLAT BURNER FLAMES. *J. Inst. Fuel*, **26**, 282-288 (1953) December.

This paper contains a very good discussion of diffusion flames with definitions of normal terminology related to flame phenomena. The paper presents the results of a study on flat diffusion flames. Combustion characteristics are given for different gases on a variety of jets.

M. Quinn

Flue Gas Corrosion

Gumz, W. SULFUR IN FUELS AND DEW-POINT OF FLUE GASES. *Combustion*, **25**, 53, 54 (1953) November.

The harmful effect of sulfur on the dewpoint of flue gases is considered. While experimental data shows that a very high dewpoint should

be expected even with a moderate sulfur content, practical observations indicate that sulfur shows little effect up to a certain threshold and that other conditions such as burner design, furnace temperature and quality of mixing were of much greater effect.

D. J. Dennison

Ore Reduction

Bitsianes, G. and Joseph, T. L. SOLID PHASE IDENTIFICATION IN PARTIALLY REDUCED IRON ORE. *J. Metals*, 5, 1641-1647 (1953) December.

The reaction kinetics of the reduction of iron ore with hydrogen was studied using a partially reduced iron ore specimen. The specimen was sampled at various interphases, which were distinguishable when it was properly cut and polished. Four phases $(Feo)_x$, Fe_3O_4, Fe_2O_3; and Fe were obtained at reducing temperatures above 570°C, while at lower temperatures no $(Feo)_x$ was present. S. Mori

Oppegaard, A. G. (assigned to National Lead Co.) REDUCTION OF IRON ORES. U. S. 2,663,632 (1953) December 22.

Iron ore (3-15 mm size) is mixed with ¼ part coke of minus 5 mm size and heated at 1000°F. in a rotary kiln until a product of 70% metal content results. This product, without cooling, is passed into a shaft furnace and treated with a counter-current stream of coke-oven gas (60% H_2, 10% CO). Further endothermic reduction occurs to yield a product of 90% iron, which also is cooled by the gas down-shaft.

O. P. Brysch

Tschop, H. E., Carter, J. E. and Goodrich, C. B. (assigned to International Nickel Co., Inc.) REDUCTION OF OXIDES. U. S. 2,663,631 (1953) December 22.

Oxides of cobalt, nickel and copper are partially reduced by heating in pulverized form (0.1 in to 0.3 in.) in an down-flowing annular column at 1700° to 1900°F. in a counter-current stream of methane. The product, containing 88% to 95% metal and 0.4% to 4% fine, active carbon can be directly converted to high-grade metal in electric furnaces.

O. P. Brysch

4. CARBONIZATION AND GASIFICATION

Carbon Oxidation

Madley, D. G. and Strickland-Constable, R. F. THE KINETICS OF THE OXIDATION OF CHARCOAL WITH NITROUS OXIDE. *Trans. Faraday Soc.* (British) 49, 1312-23 (1953) November.

A series of experiments on the study of the kinetics of the N_2O and carbon reaction indicated that intermediate steps consisting of the formation of both labile and stable oxides adsorbed on the solid surface would explain its mechanism. The composition of the surface reacting layer may be quite complex. The correlation of the experimental results to simple kinetic mechanisms may be a result of balancing of a large number of complex factors rather than to a essential simplicity of mechanism.

S. Mori

Coke Structure

Riley, H. L. COKE FORMATION: A MACRO-POLYMERIZATION REACTION. *Gas World*, 138, Coking Sect. 94-96 (1953) November 7.

This review of fundamental aspects of coke structure and coke formation extends the author's theories of "pyro polymerization" of pure carbon-hydrogen compounds. Three-dimensional cross-linking of vinyl benzene polymers during carbonization affords a new approach. Graphitic (hexagonal), diamond (cubic), and a third possible structure (of ortho-tetra-phenylene type) are discussed, and the latter is suggested as accounting for the hardness, strength and abrasiveness of coke. O. P. Brysch

Fluidized Coking

Pevere, E. F., Arnold, G. B. and Hess, H. V. (assigned to The Texas Company) CARBONIZATION OF COAL. U. S. 2,664,390 (1953) December 29.

A process is described for the production of coke of uniform small particle size from coal which has been liquefied by heating in the presence of a liquid hydrocarbon, atomized and subjected to carbonization temperatures in a fluid bed. E. J. Pyrcioch

Fuel Handling

McCabe, J. C. FUEL HANDLING AND STORAGE. *Power*, 97, 75-98 (1953) December.

A comprehensive presentation is made of the basic methods and equipment for storing and handling fuels for power station operation. Coal handling and storage is treated in all of its aspects, from receiving and unloading through preparation and storage to in-plant handling. Diagrams of available coal handling equipment drawn from manufacturers literature are included. For oil storage and handling the items presented include tanks, pumps, heaters and required piping. Since gas is normally stored by the supplier only the handling phase is discussed with emphasis on recommended industrial gas piping practices. E. J. Pyrcioch

Gasification

Chaney, N. K. METHODS OF MAKING A HIGH BTU GAS FROM COAL. *Amer. Gas Assoc. Monthly*, 35, 33, 34 (1953) December.

A summary of the AGA report "A Critical Survey of Methods of Making a High Btu Gas From Coal" Chapt. I deals with the broad objectives of basic assumptions of the survey. Chap. II is a resume of the principles of high Btu gas manufacture. Chapt. III details the more important gasification process, while Chapt. IV discusses the significant solid fuel characteristics for gasification. Chapt. V is an examination of the relation of temperature and pressure variables. Chapts. VI and VII deals with research problems and the promising lines of approach. G. V. Vosseller

Dickinson, N. L. (assigned to The M. W. Kellogg Co.) GASIFICATION OF POWDERED CAKING TYPE COAL. U. S. 2,662,007 (1953) December 8.

A gasification process is outlined for converting coking type coals to water-gas and synthesis gas whereby the coal is first crushed to 8-10 mesh particle size, pressurized to 500-600 psig by lock hoppers, mixed with steam; the steam-coal mixture being passed through an expansion nozzle for additional pulverization, followed by gasification of the steam-coal mixture by partial combustion in the presence of oxygen. C. G. von Fredersdorff

Totzek, F. ENTWICKLUNG DER KOHLENSTAUBVERGASUNG NACH KOPPERS-TOZEK UND IHRE BEWAEHRUNG IM GROSSBETRIEB. (DEVELOPMENT OF COAL DUST GASIFICATION BY KOPPERS-TOTZEK AND ITS PROOF-TESTING IN LARGE-SCALE OPERATION. *Brennstoff-Chemie*, 34, 361-67 (1953) December 16.

The earlier experiments of H. Koppers G. m. b. H., begun in 1938, on gasification of coal dust first are discussed. The essential improvement, developed in the Louisiana, Mo. demonstration plant of the U. S. Bureau of Mines, comprised the injection of a premixed coal dust-oxygen stream axially into a horizontal cylindrical reactor space with adjacent tangential introduction of steam to form a surrounding reducing zone and long path of coal particle. This principle has been successfully applied in the Typpi Oy, Finland, synthesis gas plant, which begun operation in June 1952. Three generators gasify pulverized (90% thru 70 m/cm) Upper Silesian coal of 16%-19% ash at a rate of 50 tons per day, to yield 1775 cu.meters gas/ton containing 51% CO, 34% H_2 and 13% CO_2. Ash removal begins at base of generator, but occurs chiefly in the smoke-tube exchanger, cyclone and final disintegrator. After H_2S removal (400 g/100 m^3) the organic sulfur (40 g/100-m^3) is catalyzed to H_2S and removed by washing under pressure. Operating results, explosion safety and control practice are discussed, with diagrams and illustrations.

O. P. Brysch

COMPLETE GASIFICATION PLANT. *Coke and Gas* (British) 15, 457-61, 464 (1953) December; *Gas Times*, 77, 453-55 (1953) December 25; *Gas J.* (British) 276, 725-29 (1953) December 16; *Gas World* (British) 138, 1578-81 (1953) December 19.

The earlier "double gas" system of Strache for complete gasification has evolved into the modern Gaz Integral (G.I.) process. The International Furnace Equipment Company has installed plants at Naples, Rome, Trieste, and Vierzon, each generator producing 2 million CF per day of 335 Btu gas, for mixing with retort coal gas or for enrichment by oil carburetion. These operate on widely available high-volatile coals of B.S. swelling No. 3½ or less,

predistilled in a retort followed by gasification in a completely mechanized cycle. A flow sheet and illustrations of plants are given. Woodall-Duckham Co. has obtained rights to build G.I. plants in Britain and is installing a 2-million CF per day generator (with carbureting) for the North Thames Gas Board. E. J. Pyrcioch

Graphite Industry

Hader, R. N., Gamson, B. W. and Bailey, B. L. GRAPHITE ELECTRODES, A STAFF-INDUSTRY COLLABORATIVE REPORT. *Ind. Eng. Chem.*, 46, 2-11 (1954) January.

The graphite electrode industry has grown within 50 years to be of the same basic nature as the sulfuric acid industry in chemical and metallurgical fields. The raw materials (petroleum coke and pitch), their properties, treatment, and the molding, baking and graphitizing processes and equipment are described together with flow-sheets, process yields and control testing methods. Demands for more and better graphite products have required constant chemical and engineering research for improved properties and methods, and for diversification of uses. O. P. Brysch

LP-Gas Standby

Wastie, A. E. LP-GAS STANDBY PLANTS. *Canad. Gas J.*, 47, 7-9 (1954) January.

A brief review of the equipment needed for an LP-G standby plant. No economic comparison of other types of standby equipment is made.
W. G. Bair

Oil Gas

Eastwood, S. C. (assigned to Socony-Vacuum Oil Co.) GAS MANUFACTURE. U. S. 2,662,006 (1953) December 8.

A reactor for continuous production of gas from fuel oil, air and steam is described. A hot granular solid Heat Transfer Medium (HTM) passes downward through four zones in the reactor: combustion zone, seal zone, water gas zone, and cracking zone. Air is introduced to the combustion zone to oxidize part of the coke on the incoming HTM, which is heated by the combustion reaction. The flue gases exit overhead. Steam is injected at the seal zone, part of it traveling upward with the combustion gases, and the remainder passing down into the water gas zone, where it reacts with the unburned coke on the HTM. Hot coke-free HTM from the water gas zone passes down into the cracking zone, where oil is introduced. The product from the cracking zone and the gas from the water gas zone are removed from the side of the reactor at a point between the two bottom zones. The coked HTM is returned to the top at the reactor by an external elevator.
J. J. Guyer

Evans, L. P. (assigned to Socony-Vacuum Oil Co.) GASEOUS FUEL PRODUCTION. U. S. 2,662,005 (1953) December 8.

A reactor for continuous production of gas from fuel oil, air and steam is described. A hot granular solid Heat Transfer Medium (HTM) passes downward countercurrent to the upcoming product gases through four zones in the reactor: heat exchange zone, in which the HTM is heated by the product gases as they pass upward; combustion and water gas reaction zone, where air is introduced to oxidize part of the coke deposited on the HTM; coking and gasification zone, where oil is introduced to the hot HTM; and steam generation zone, where water is injected to produce steam and to cool the HTM. An external elevator returns the HTM to the top of the reactor. The product gases are removed from the top of the reactor.
J. J. Guyer

Ore-Coke

McFarlin, C. J. (assigned to Air Reduction Co.) METHOD AND APPARATUS FOR PRODUCING MIXTURES OF COKE AND MINERAL MATERIALS. U. S. 2,658,039 (1953) November.

To produce a lime-coke or ore-coke agglomerate suitable for further furnacing, the first-mentioned raw material is advanced continuously through a rotary kiln, is dried calcined and then mixed with coal or other carbonaceous material fed axially into a final agglomerating and coking zone. The combustion of the volatiles (with controlled axially-fed air jets) provides the heat for high or low temperature coking.
O. P. Brysch

Sulfur Removal

Düwel, G. DIE SCHWEFELREINIGUNG DER GASKOKEREI GRASBROOK DER HAMBURGER GASWERKE G. M. B. H. (SULFUR REMOVAL AT THE GRASBROOK COKE-OVEN GAS PLANT OF THE HAMBURGER GASWERKE G. M. B. H.) *Gas- und Wasserfach*, 94, 684-88 (1953) December 1.

Details of the new enlarged oxide purifiers of the Grasbrook plant are given from the design and operating viewpoint. Two 4-box sets and one 3-box set, constructed of concrete, purify 600-690 M cu. meters (21-24 MMCF) per day of coal gas (250-350 gr. H2S/100) and 200-220 M cu. meters (7-7.7 MMCF) per day of watergas (80-150 gr. H2S/100). The design is of the deep-box type, with seven 50-cm (20-in.) layers superimposed, with 3 inlet-outlet connections for reversal operations. Handling machinery for charging and discharging is described. Investment and operating costs are analyzed. O. P. Brysch

Spichal, W. BEITRAG ZUR TECHNOLOGIE DER ENTSCHWEFELUNG VON SYNTHESEWASSERGAS MITTELS AKTIVKOHLE. (CONTRIBUTION TO THE TECHNOLOGY OF DESULFURIZATION OF SYNTHESIS GAS BY MEANS OF ACTIVATED CARBON. *Gas- und Wasserfach*, (German) 94, 679-684 (1953) December 1.

Processes for removal of hydrogen sulfide and organic sulfur from synthesis gas by means of active carbon are described. The I. G. Farben process for hydrogen sulfide removal has been employed on a plant scale for many years. The gas is mixed with a small amount of O_2 and NH_3 and passed over an active carbon made from brown coal. H2S is oxidized to free sulfur, which is recovered and the carbon regenerated by a process based on washing the carbon with ammonium sulfide solution. Improvements in the method of handling the active carbon are described, and requirements of the process including water, steam, power, and chemicals are given. In the process for removal of organic sulfur the humidity of the gas is adjusted, a small amount of oxygen and ammonia is added, and the gas is passed over an active carbon made from anthracite. The sulfur compounds, including CS_2, COS, and thiophene, are oxidized to one or more of the compounds ammonium sulfate, ammonium thiosulfate, and thiourea. The active carbon is regenerated by a process based on washing the salts out of the carbon with water and reactivating with steam at 360-400°C. D. M. Mason

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Beebe, R. A. and Young, D. M. HEATS OF ADSORPTION OF ARGON ON A SERIES OF CARBON BLACKS GRAPHITIZED AT SUCCESSIVELY HIGHER TEMPERATURES. *J. Phys. Chem.*, 58, 93-96 (1954) January.

The calorimetric heats of adsorption have been measured for argon at — 195°C on a series of carbon blacks graphitized at the successively higher temperatures, 1000°, 1500°, 2000° and 2700°C. X-Ray and electron microscope studies reported by Schaeffer, et al., indicate a higher degree of graphitization with increasing temperature of heat treatment; this would result in progressively more homogeneous surfaces within the series. Our experimental results illustrate clearly the change in the shape of the heat-coverage curve with increasing degree of surface homogeneity produced by high temperature heat treatment. These results may be correlated with the stepwise isotherms found by Polley, et al., on the same series of blacks.

Authors' Abstract

Catalyst Properties

Viland, C. K. EVALUATION OF CRACKING CATALYSTS. *Petroleum Processing* 8, 1874-1880 (1953) December.

A bench-scale, automatically-controlled catalytic cracker, are used in the Avon Research Laboratories of Tide Water Associated Oil, has been designed and described in the literature and the article concerns a redesigned unit. The redesigned unit corrects two major limitations imposed by the use of pelleted catalyst. These limitations were: 1) Relatively low reactor tem-

peratures must be employed to permit burning off of catalyst deposits without reaching excessive regeneration temperatures. 2) Varying degrees of compression of powdered catalyst to form pellets change the characteristics of cracking catalysts. H. A. Dirksen

Dehydration

Gordon, J. A. OPERATING THE LIQUID-DESICCANT DEHYDRATION PLANT. *Oil Gas J.*, 52, 108-111 (1953) December 7.

Successful control and operation of a diethylene glycol dehydration plant would depend on a sound knowledge of the dewpoint of the raw gas and of the adverse temperature conditions in the transmission system. Maintenance and operation problems frequently encountered involve the contamination, breakdown and loss of glycol, corrosion of pumps and rectifier plates, and foaming. Practical experience shows that use of scrubbers can remove most of the dust, condensed gasoline and water in the raw gas while insertion of vent tanks in the line can rid the glycol solution of such gaseous contaminants as oxygen and hydrogen sulfide, any rust or other precipitates being strained off with filters. Proper choice of material of construction and careful regulation of reboiler temperature and flow rate are very effective in reducing operation troubles due to corrosion of equipment and breakdown of the glycol solution. Antifoaming agents have been successfully employed as foam breakers. Glycol loss can be kept down by proper operating procedures. S. Hu

Waterhouse, F. M. USE OF SORBENTS FOR DRYING PROCESS GAS AND AIR. Amer. Soc. Mech. Eng., Paper No. 53A-204 (1953) November-December.

Reduction of the temperature and humidity of process gas or air is normally effected with mechanical refrigeration and heat-exchange equipment. The vapor pressures of certain chemical sorbents render them capable of these control functions in certain cases. This paper reviews the theory of sorbent-controlled temperature and humidity, listing several available sorbents and indicating the criteria for selecting a control system involving sorbents.

Author's Abstract

Dispatching

Chadwell, S. A. GAS DISPATCHERS MEET AND MASTER FULL RANGE OF DELIVERY PROBLEMS. *Amer. Gas J.*, 179, 17, 38, 39 (1953) December.

The duties and responsibilities of gas dispatchers are presented, and the problems confronted by those responsible for routing the flow of gas. Training, duties, and activities, are outlined.

B. E. Eakin

Gasoline Recovery

"LEASE SIZE" LOW TEMPERATURE GASOLINE PLANTS. *Cal. Oil World*, 46, 1-2, 4, 6, 8 (1953) December 1.

The experiences are described of one manufacturer in the design, operation and economics of low temperature "lease size" gasoline recovery plants for use by operators of isolated leases which produce relatively small volumes of low pressure natural gas or which cannot justify a large capital investment in a "permanent" type gasoline plant because of the reserve picture. These plants offer the small operator a reasonable return on his investment required to meet state conservation laws and present extremely attractive economic possibilities where the gas composition and the price of recovered products meet certain minimum standards. H. C. Owen

H_2S Removal

Sherwood, P. W. THE SELECTIVE REMOVAL OF HYDROGEN SULPHIDE FROM HYDROCARBON GASES. *Petroleum*, 17, 21-23 (1954) January.

Current American practice and recent developments including use of methyl diethanol amine are discussed. D. M. Mason

Increased Supply

TRANSCONTINENTAL TO INCREASE PEAK CAPACITY OF ITS SYSTEM BY 50

PER CENT. *Gas Age*, **112**, 45, 73-75 (1953) December 17.

Arrangement with Texas Eastern Transmission Corp. will enable Transcontinental to store gas in the Oakford reservoir for winter delivery and 80 million dollar construction program for 533 miles of looped line and more compressor stations will raise Transcontinental's peak system-capacity to 820 MMCF per day.

R. F. Bukacek

LP-Gas, 1953

Benz, G. R. and Tucker, P. W. PHILLIPS REPORT LPG SALES NEAR FIVE BILLION GALLONS IN 1953. *Butane-Propane News*, **16**, 36-39 (1954) January; *Amer. Gas Assoc. Monthly*, **36**, 28, 34, 35 (1954) January; *LP-Gas*, **14**, 128-31, 194-95 (1954) February; *Gas Age*, **113**, 54-57 (1954) January 14; *Natnl. Petroleum News*, **46**, 21, 24, 26 (1954) January 6; *Oil Gas J.*, **52**, 46-48 (1954) January 4; 166-7, Jan. 25; *Petroleum Engr.*, **26**, E25-26, 28, 30, 33-E35 (1954) January; *Petroleum Refiner*, **33**, 158 (1954) January; *Gas Heat*, **5**, 32, 34 (1954) February; *Petroleum Processing*, **9**, 222, 223, (1954) February.

Sales of LP-gas reached new levels in 1953, though sales to gas manufacturing or utility use dropped 5%. Domestic, motor fuel, and chemical uses accounted for the increase. Marketed production figures are given from 1922 to 1953 with a breakdown on the various uses. A variety of other statistical information is presented as well as opinions on the position of the LPG industry in 1954. R. F. Bukacek

Methane Pyrolysis

Cromeans, J. S. (assigned to Phillips Petroleum Co.) PROTECTION OF REFRACTORIES IN A REACTION SYSTEM FROM HIGH TEMPERATURES BY BLANKETING GASES. U. S. 2,664,402 (1953) December 29.

Synthesis gas is generated continuously from methane oxygen and steam in an insulated chamber, the flow of reactants being arranged so that the refractories are protected by a blanket of methane and steam which absorbs heat by endothermic reaction.

C. G. von Fredersdorff

Orifice Meters

Garabrant, H. R. CALCULATIONS FOR NATURAL GAS ORIFICE-METER COEFFICIENTS. *Instruments*, **26**, 1897-1898 (1953) December.

Use of handbook tabular data makes possible rapid calculation of orifice-meter coefficients. Two examples—one for regular charts and one for square-root charts—illustrate the steps necessary. Author's Abstract

Straight, W. D. INSTALLATION AND MAINTENANCE OF ORIFICE METERS. *Instruments*, **26**, 1895-1897 (1953) December.

Proper installation, inspection and maintenance of orifice fittings, regulators and differential gages are necessary for accurate measurements. Maintenance details are presented.

Author's Abstract

Over-Pressure Protection

Dye, G. G. COMPLETE STATION SHUTOFF AS A MEANS OF PREVENTING OVERPRESSURE. *Gas*, **29**, 55 (1953) December. Paper No. OS—53-7 Am. Gas Assoc., Oct. 1953.

A discussion of the use of complete shutoff as a means of over-pressure protection with the pros and cons listed for ready comparison.

R. A. Bukacek

Miller, D. J. MECHANICAL RELIEF DEVICES. *Gas*, **29**, 55-56 (1953) December.

A discussion of mechanical relief devices for over-pressure protection with emphasis on factors that are important to proper determination of relief capacity. A number of the less obvious factors are considered in some detail.

R. F. Bukacek

Parker, H. W. OVER-PRESSURE PROTECTION. *Gas*, **29**, 53-56 (1953) December.

A description of experience with the use of oil seals for over-pressure protection. Recommendations with regard to location, venting and seal pot size are made for district regulator stations. R. F. Bukacek

Production

Bertuzzi, A. F., Welchon, J. K. and Pettmann, F. H. DESCRIPTION AND ANALYSIS OF

AN EFFICIENT CONTINUOUS-FLOW GAS-LIFT INSTALLATION. *J. Petroleum Techn.*, 5, 271-278 (1953) November.

A series of gas-lift tests was made which verified conclusions reached from previous studies and which showed that gas-lift performance could be calculated if reasonably accurate data on the producing characteristics of the well are available. The test installation is described. Its essential features consisted of a rate-of-flow controller to regulate the input gas and an auxiliary string of small diameter tubing to conduct the input gas to the point of injection in the eductor tubing. In general, it was shown that for continuous gas-lift operation, injection should be as deep as possible consistent with available gas pressure and desired rate of production. Calculated curves are presented which completely characterize the gas-lift performance of the well tested.

Authors' Abstract

Remote Regulation

Roark, E. M. PUSH-BUTTON CONTROLS DENVER'S GAS PRESSURE. *Gas*, 29, 33-35 (1953) December.

A description of the equipment used to operate and remote control regulator stations. The new system is remote-indicating and is operated over leased telephone lines. Any power failure, or failure in the control circuit, results in the station regulator raising the system's pressure to a safe and adequate level to assure continuity of service. B. E. Eakin

Reservoir Engineering

Cornell, D. and Katz, D. L. FLOW OF GASES THROUGH CONSOLIDATED POROUS MEDIA. *Ind. Eng. Chem.*, 45, 2145-52 (1953) October.

The Kozeny equation for laminar flow has been modified and extended to cover both laminar and viscous flow of gases through consolidated porous media by means of a modified friction factor—Reynolds Number plot, involving variables that are all measurable. Good correlation has been obtained for date on four gases flowing through twenty-four samples of sandstones, limestones, and dolomites. S. Hu

Dodson, C. R., Goodwill, D. and Mayer, E. H. APPLICATION OF LABORATORY PVT DATA TO RESERVOIR ENGINEERING PROBLEMS. *J. Petrol. Technology*, 5, 9 Sect. 1; 8, 287-298 Sect. 2 (1953) December.

Methods currently used to predict recovery from a gas-condensate reservoir under a depletion operation are satisfactory, but limited in accuracy under cycling operations, even when the bed data is available. PVT information is a must in estimating condensate reservoirs. The methods are more complex than those used for estimating reserves of crude oil. The correct interpretation of laboratory PVT data and its application to reservoir engineering is discussed. The paper summarizes the historical background, possible errors in sampling and analysis, and the type of information required of PVT determination. The need for an approximation of the liberation sequence occurring in the producing formation, flow string, and surface separators, is emphasized. A "composite" liberation, combining the differential and flow data, is suggested as the best means of approximation of production behavior. The need for experimental work concerning true reservoir gas liberation under field conditions is pointed out. B. E. Eakin

Menzie, D. E. HOW TO SELECT THE BEST DECLINE CURVE. *World Oil*, 137, 180, 182, 184, 186, 196 (1953) December.

Oil production may vary with time and pressure in a number of ways, which can be expressed by mathematical equations. Any of the equations representing production can be plotted as a straight line on the appropriate type of graph paper. This allows reservoir behavior under secondary recovery to be predicted if the right type of curve is selected. Proper selection of curves is explained. B. E. Eakin

Simm, C. N. CALCULATING RECOVERY OF LIGHT HYDROCARBONS. *Oil Gas J.*, 52, 104-107 (1953) December 7.

A new method is now available to evaluate the potential recovery of light hydrocarbons by dry-gas cycling. The use of cycling equations makes it possible rapidly to determine the composition of effluent gas at any time during the

proposed operation. Factors controlling the recovery are the composition of reservoir oil and gas phases, composition of injected gas, permeability variations of the reservoir, cycling temperature and pressure, and well spacing. Therefore, the practicality of dry-gas cycling as a means to recover light hydrocarbons from a semi-depleted oil reservoir is specific to each reservoir. Experimental investigation showed recovery to be a direct function of temperature, an inverse function of pressure, and independent of usual flow rates of cycling.

Author's Abstract

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Catalytic Reforming

Shirk, R. M. and Ardern, D. B. NEW DESIGN FEATURES OF HOUDRIFLOW. *Petroleum Refiner*, 32, 121-125 (1953) December.

Present design improvements on the Houdriflow catalytic cracking are discussed. Major changes are made in the reactors, vapor disengager, burn-off air distributor, and regenerated catalyst cooling coils. W. G. Bair

Weber, G. CAT REFORMING BOOM IS ON. *Oil Gas J.*, 52, 46-49 (1953) December 28.

A list (with charge capacity) of catalytic reforming units in operation or under contract for construction is given. By the end of 1954, 51 more catalytic reforming units with the 43 units now in operation will triple the present daily charge capacity of 200,000 bbl.

W. J. Pleticka

Catalyst Structure

Johnson, M. F. and Ries, H. E., Jr. THE STRUCTURE OF COBALT CATALYSTS SUPPORTED ON DIATOMACEOUS EARTH. *J. Phys. Chem.*, 57, 865-873 (1953) December.

Various points are presented as evidence for the existence of catalyst-support interaction in the case of cobalt oxide precipitated in the presence of a diatomaceous earth support. A complex is believed to form which has the following properties: (1) a high surface area in small pores; (2) a sintering temperature distinct from those of cobalt oxide or silica gel; and (3) a resistance toward reduction by hydrogen to cobalt metal. The characteristic adsorption-desorption isotherms for nitrogen are discussed in terms of pore structure. The surface area of this complex increases with decreasing cobalt content and increasing support area, within certain limits. Preliminary results with supported iron oxide show some indication of the same type of pore structure while in the case of chromia the presence of support hinders the normal shrinkage during drying, leading to a large-pore structure resembling aerogels.

Authors' Abstract

Desulfurization

Kalichevsky, V. A. and Peters, E. H. DESULFURIZATION TODAY. *Petroleum Refiner*, 32, 82-92 (1953) December.

How desulfurization fits into the petroleum refining picture is outlined, and nine desulfurization processes, including both catalytic conversion and solvent extraction processes are described. D. M. Mason

Kalinowski, M. L. (assigned to Standard Oil Co.) DESULFURIZATION OF PETROLEUM OILS. U. S. 2,663,673 (1953) December 22.

Sulfur compounds are removed from petroleum distillates by contacting in the liquid phase at temperatures below 110°F. with asphaltenes obtained from reduced crude tars and bitumins, but preferably from oxidized cracked tars.

D. M. Mason

Krause, J. H. and Brown, R. H. (assigned to Standard Oil Co.) REFINING SOUR HYDROCARBON OILS. U. S. 2,663,674 (1953) December 22.

In the sweetening of heating oils by oxidation of mercaptans to disulfides by contacting the sour oil with air and a highly concentrated acqueous caustic solution in the presence of a catalytically active copper compound, color degradation of the oil can be minimized by extracting color-forming bodies with methanol prior to the sweetening step. D. M. Mason

Wolff, W. F. and Johnson, C. E. (assigned to Standard Oil Co.) EXTRACTION OF SULFUR COMPOUNDS WITH THIOLSULFONIC ESTERS. U. S. 2,664,385 (1953) December 29.

Esters of thiolsulfonic acids have been found to be effective solvents for selective extraction of organic sulfur compounds from petroleum oil fractions. D. M. Mason

Fischer-Tropsch

Dorschner, O., Wenzel, W. and Kayser, H. G. (assigned to Metallgesellschaft A-G.) TEMPERATURE CONTROL IN THE CATALYTIC HYDROGENATION OF CARBON MONOXIDE. U. S. 2,662,911 (1953) December 15.

Various methods are described and illustrated for removing the exothermic heat of reaction in flow reactors for the catalytic hydrogenation of carbon monoxide. One arrangement provides a liquid cooling medium at its boiling point surrounding small diameter catalyst tubes. Other designs have the catalyst disposed between lamellar sheets which are transversed by a series of cooling tubes. C. G. von Fredersdorff

Fracturing Benefits

Oakley, J. B., Jr. BOON TO OKLAHOMA'S OIL INDUSTRY. *Petroleum Eng.*, 25, B73, 76 (1953) December.

The hydraulic fracturing process has stimulated operations and substantially increased the recoverable reserves in the state. B. E. Eakin

Residuals Coking

Mekler, V., Schutte, A. H. and Whipple, T. T. THE LUMMUS CONTINUOUS CONTACT COKING PROCESS. *Petroleum Refiner*, 32, 131-134 (1953) December.

A description of a new contact coking process for the upgrading of residues heavier than those used in the delayed coking processes. The process produces a maximum of middle distillate products and a clean hard coke uniform in size. The process is also claimed to be cheaper than delayed coking. G. V. Vosseller

Secondary Recovery

Sweeney, A. E., Jr. SECONDARY RECOVERY IN OKLAHOMA. *Petroleum Eng.*, 25, B12, 14, 16, 18 (1953) December.

More than one billion barrels of oil will be produced thru gas and water injection in Oklahoma fields. The formations of this area are susceptible to water flooding, and there are increasing applications of this method to new areas of the state. B. E. Eakin

Shale Oil

Castner, R. C., Archibald, R. C. (assigned to Shell Development Co.) SHALE OIL REFINING. U. S. 2,662,843 (1953) December 15.

The high coke formation during catalytic cracking of shale oil has been attributed to the presence of organic nitrogen compounds in amounts greater than those usually found in petroleum. This patent describes a process for solvent extraction of vis-broken or crude shale oil with formic acid which is claimed to lower the nitrogen content of the raffinate to a value between 0.4 and about 0.9 weight percent, thereby improving its catalytic cracking properties. E. B. Shultz

Spraberry Start-up

Enright, R. J. SPRABERRY TO RESUME PRODUCTION. *Oil Gas J.*, 52, 50, 51 (1953) December 28.

Completion of facilities to handle approximately 225 MMCF daily of Spraberry gas leads the Commission to end the 9-month shutdown of the Spraberry trend field. The only production during shutdown order was from wells where the casing-head gas was being sold to pipelines. El Paso Natural, Permian Basic Pipe Line, and Northern-Natural cooperated in constructing the increased outlet for Spraberry gas. B. E. Eakin

Tuscola Chemicals

McDonald, J. F. HYDROCARBON RECOVERY AT TUSCOLA. *Petroleum Processing*, 8, 1894-1896 (1953) December.

The initial start-up difficulties of the hydrocarbon recovery section of the Tuscola plant

of NPC Corp. are discussed. Remedies used for the various trouble spots are given in detail.
W. G. Bair

WHAT'S UNIQUE ABOUT TUSCOLA? *Petroleum Processing*, 8, 1889-1892 (1953) December.

Products and approximate production rates are listed for the new NPC Corp. plant at Tuscola, Ill. The plant is in the unique position of producing petrochemicals at the center of demand, thus avoiding product transportation charges.
W. G. Bair

7. ANALYTICAL METHODS AND TESTS

Gas Analyses

McMahon, W. J. and Foster, L. S. THE VACUUM FUSION METHOD FOR DETERMINING MINUTE QUANTITIES OF GASES IN METALS. *J. Chem. Education*, 30, 609-613 (1953) December.

The adverse effects of gaseous impurities on the properties of metals are discussed. In the vacuum fusion method, metal samples are degassed in an induction furnace at 1600-2400°C. The hydrogen and oxygen are converted to water and carbon dioxide which are removed by cooling. After the residual nitrogen is measured in a McLeod gage, the carbon dioxide is vaporized and similarly measured. Hydrogen is determined by difference. The accuracy of the method and techniques required for interfering substances are discussed.
C. E. Hummel

Stein, T. W. and Reid, R. C. WATER VAPOR SATURATION IN GAS-MEASURING BURETS. *Anal. Chem.*, 25, 1919-22 (1953) December.

The importance of saturating gas with water vapor before making volume measurement in the Orsat analysis is discussed. Calculations are given which indicate that gas is saturated with water vapor in 2 or 3 seconds in a clean buret whose sides are covered with a water film. A time of 4 hours was insufficient to saturate gas in a buret whose sides are not wetted. The use of detergent in the water used to saturate the gas is recommended. C. E. Hummel

Naphthalene Method

Klein, N. J. and Struthers, G. W. DETERMINATION OF NAPHTHALENE IN WASH OIL AND COKE OVEN GAS. *Anal. Chem.*, 25, 1818-1830 (1953) December.

The classical picrate methods for determining naphthalene in wash oil and coke-oven gas were time-consuming and not wholly quantitative. Poor recovery was experienced in tests where known amounts of naphthalene were added to wash oil. Spectrophotometric methods were developed for determining naphthalene in wash oil by infrared, and in coke-oven gas by ultraviolet techniques. Naphthalene concentrations in coke-oven gas as low as 0.001% can readily be measured, as can concentrations up to 4% in wash oil. Accuracy of the methods is 0.5% relative. The spectrophotometric methods are direct, simple in application, and specific, and offer a definite improvement in sensitivity, accuracy, and analysis time. No significant interferences are encountered from the more common compounds associated with naphthalene. The methods have been applied successfully to routine plant samples. Authors' Abstract

Nitrogen in Oils

Wankat, C. and Gatsis, J. G. DETERMINATION OF TOTAL NITROGEN IN PETROLEUM DISTILLATES BY CATALYTIC HYDROGENATION. *Anal. Chem.*, 25, 1631-33, (1953) November.

Currently available procedures for determination of total nitrogen in petroleum distillates were found unsatisfactory when the nitrogen content was below 0.01% (100 p.p.m.). A high pressure catalytic hydrogenation process for determining total nitrogen in petroleum distillates in the range of 1 to 100 p.p.m. consists essentially of quantitatively reducing organic nitrogen to ammonia by high pressure hydrogenation in an autoclave with a nickel catalyst and absorbing the resulting ammonia on acidic alumina which is in admixture with the catalyst mixture. The absorbed ammonia is determined by a conventional Kjeldahl distillation of the catalyst mixture. Interference due to sulfur is eliminated by proper choice of sample size. Data are presented on synthetic sam-

ples containing the types of nitrogen compounds found in petroleum as well as results on a variety of light petroleum distillates, both virgin and cracked. Author's Abstract

Sampling

Spracklen, S. B. I. OBJECTIVE: A MEASURABLE AND REPRESENTATIVE SAMPLE. *Oil Gas J.*, **52**, 94-96 (1953) December 7.

Selection of the sampling point, filters to remove solids, scrubbers to remove contaminating gases, use of agglomerators and vaporizers, effect and control of sample temperature and flow fluctuations, and control of measuring cell pressure in sampling systems for continuous analyzing instruments are discussed.

D. M. Mason

Tar Assay

McNeil, D. and Vaughan, G. A. COMPOSITION OF COAL TARS. *Inst. Gas Eng.* (British) Publ. No. 438 (1953) November 24; *Gas World* (British) **138**, 1385 (1953) November 28; *Gas J.* (British) **276**, 779-780 (1953) Dec. 23; *Gas Times* (British) **77**, 305, 384-86 (1953) Dec. 11.

A laboratory assay method is described, which was developed so that the primary distillation yields of soft pitch would be comparable to that of commercial plants. Assay data for 6 coke-oven, 4 vertical-retort, 2 horizontal-retort, and one Lurgi tar are presented, to show the yields of commercially important constitutents. Carbonizing conditions and comparisons of assay and commercial still results are also tabulated.

O. P. Brysch

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption

Chessick, J. J., Healey, F. H. and Zettlemoyer, A. C. ADSORPTION STUDIES ON METALS. II. ABSOLUTE ENTROPIES OF ADSORBED MOLECULES ON MOLYBDENUM. *J. Phys. Chem.*, **57**, 912-915 (1953) December.

Absolute entropies of adsorbed gas molecules on reduced molybdenum were calculated from the experimentally obtained adsorption isotherms. The latter yielded the equilibrium heat term. These values together with the entropies of the gas in the pure state, yielded the desired quantities. S. Mori

Compressibility

Hall, N. A. and Ibele, W. E. THE TABULATION OF IMPERFECT-GAS PROPERTIES FOR AIR, NITROGEN, AND OXYGEN. Amer. Soc. Mech. Eng. Paper No. 53—A-5 (1953) November-December.

Tables of second and third virial coefficients, temperature, derivatives, and compressibility factors for air, nitrogen and oxygen covering the temperature range from 100° to 5000° R. and density up to 9.0 lb/cu.ft. are given.

D. C. Gami

Equilibria

Carmichael, L. R., Sage, B. H. and Lacey, W. N. PHASE EQUILIBRIA IN HYDROCARBON SYSTEMS VOLUMETRIC BEHAVIOR OF n-NONANE. *Ind. Eng. Chem.*, **45**, 2697-2704 (1953) December.

Pressure, volume, and temperature data for n-nonane from 100 to 460°F and pressures up to 10,000 psi are reported. Vapor pressures from 280 to 460°F were also measured. D. C. Gami

Flow Measurement

Randle, E. W. FLOW TUBES. *Instruments*, **26**, 1879 1904, 1905 (1953) December.

A description a head type element for measuring flow of fluids where the difference between impact pressure on nozzles pointing upstream and suction pressure on nozzles pointing downstream are used to measure flow rate. The flow tube measures velocities near the throat wall hence it yields a point velocity and doubtless has more application to plant measurements than gas-billing measurements. R. F. Bukacek

Gas Solubility

Zoss, L. M., Suciu, S. N. and Cibbitt, W. L. THE SOLUBILITY OF OXYGEN IN WATER. *Am. Soc. Mech. Eng. Trans.*, **76**, 69-71 (1954) January.

The solubility of oxygen in water was reported at 1000, 1500 and 2000 psia., between 32° F. and 625° F. D. C. Gami

Gas Viscosity

Hilsenrath, J. and Touloukian, Y. S. THE VISCOSITY, THERMAL CONDUCTIVITY AND PRANDL NUMBER FOR AIR, O_2, N_2, NO, H_2, CO, CO_2, H_2O, He AND A. Amer. Soc. Mech. Eng. Paper No. 53—A186 (1953) November-December.

The low-pressure viscosity and heat-transfer parameters—thermal conductivity, and Prandtl number—are tabulated for air, nitrogen, oxygen, hydrogen, argon, carbon monoxide, carbon dioxide, nitric oxide, and steam, and the thermodynamic and transport properties of these gases at the National Bureau of Standards. The properties are tabulated for atmospheric pressure and extend from 100°K (180°R) to as high as 2000°K (3600°R) in some instances. The effect of pressure on the viscosity is presented in tabular form for oxygen, nitrogen, hydrogen, steam, carbon dioxide, and argon for pressures up to 100 atm in the experimental range of temperatures. The Prandtl numbers for air given in this work are compared with existing published and unpublished values which are in extensive use. Plots are included showing the scatter among the experimental data and deviations between them and the tabulated values. They present a very clear picture of the extent and concordance of the experimental data. A monograph is included for obtaining fractional powers of the Prandtl number.

Authors' Abstract

Kestin, J. and Pilarczyk, K. MEASUREMENT OF THE VISCOSITY OF FIVE GASES AT ELEVATED PRESSURES BY THE OSCILLATING-DISK METHOD. Amer. Soc. Mech. Eng. Paper No. 53—A-67 (1953) November-December.

Data are presented for air, argon, helium, hydrogen, and nitrogen at 20° C. up to 1,000 psi. An optically ground quartz disc suspended between two optically ground quartz plates was used. Macwood's equations were used to calculate the data. The authors emphasize that the present theory of the oscillating disc viscometer is not all that is desired, but the mathematics of a better theory is quite complex. Without a theory based on non-linear oscillations the authors could not state the degree of approximation when Macwood's equations are used. This uncertainity increases with increased gas density. The abstractor believes this paper to be an excellent contribution. W. W. Clauson

Surface Properties

Sing, K. S. and Madeley, J. D. THE SURFACE PROPERTIES OF SILICA GELS. I. IMPORTANCE OF pH IN THE PREPARATION FROM SODIUM SILICATE AND SULPHURIC ACID. *J. Appl. Chem.* (British) 3, 549-556 (1953) December.

Gels were prepared by adding sodium silicate solution to sulphuric acid until a certain pH was reached, and then the products were aged, washed and dried under controlled conditions. The surface properties of the dry gels were studied by measuring adsorption isotherms of nitrogen at —195.8° and a decrease in setting time from over an hour to a few seconds. For gels prepared over this pH range, the isotherms of the two gases also changed profoundly, both sets showing the same general pattern. In one preparation the temperature was varied, and in another the aging period was reduced to the minimum; in neither case could any difference in the adsorption of nitrous oxide be detected. Activation, by soaking in very dilute sulphuric acid, was shown to be more important for a gel prepared at the higher-pH end of the range.

Authors' Abstract

Thermal Conductivity

Keyes, F. G. THERMAL CONDUCTIVITY OF GASES. Amer. Soc. Mech. Eng., Paper No. 53—A-58 (1953) November-December.

This is a continuation of 3 previous papers on the study of the thermal conductivities of gases. In addition to the previous apparatus for the range 0 to 400° C., two new units have been constructed to cover the ranges 0 to 190° C. and 400 to 900° C. Data have been presented for eleven gases. Correlations of literature data on the viscosities and thermal conductivities of the five rare gases are also included. S. Hu

Lenoir, J. M. THERMAL CONDUCTIVITY OF GASES AT ATMOSPHERIC PRESSURE. Eng. Experiment Station, University Arkansas, Bull. No. 18 (1953) August.

The experimental data from the literature was

plotted and the smoothed data was tabulated. An empirical method of calculating the thermal conductivity of a multicomponent gas mixture is presented with examples. The method consists of the proposed equation and a proposed relation for calculating the necessary constants. The multicomponent equation constants are a function of the Wassiljewa constants which are tabulated for many binary mixtures. Numerous references are cited. W. W. Clauson

Mason, H. L. THERMAL CONDUCTIVITY OF SOME INDUSTRIAL LIQUIDS FROM 0 TO 100 C. Amer. Soc. Mech. Eng. Paper No. 53-A-40 (1953) November-December.

Thermal conductivities of 21 organic liquids were determined in the temperature range 0-100°C. in a test cell made of two concentric vertical copper cylinders, the inner one being heated electrically and the outer one serving as a constant-temperature heat sink. Results were tabulated together with available literature data. S. Hu

X-Ray Structure

Keeling, R., Frazer, B. C. and Pepinsky, R. LOW-TEMPERATURE X-RAY GONIOMETER FOR STRUCTURAL STUDIES OF CRYSTAL TRANSITIONS. *Rev. Sci. Instruments*, 24, 1087-1095 (1953) December.

A detailed description of a low temperature X-ray goniometer adaptable to a Weissenberg, a General Electric powder camera, or a counter is presented. The specimen is cooled by conduction from a liquid nitrogen container while the whole apparatus is surrounded by a stainless steel Dewar jacket to obtain the required insulation. S. Mori

9. ORGANIC CHEMISTRY

Acetylene Recovery

Howard, W. B., Schoch, E. P. and Mayforth, F. R. DMF-ACETYLENE RECOVERY SOLVENT. *Petroleum Refiner*, 33, 143-146 (1954) January.

A pilot plant evaluation is given of dimethyl formamide as a solvent for concentrating acetylene from dilute gas mixtures. Experimental data for scrubbing in a 52-ft. packed column at 58 psia and 101° F. showed an acetylene product purity of 98.4 percent. E. B. Shultz

Carbon-Sulfur Reactions

Folkins, H. O., Miller, E. and Hennig, H. (assigned to Food Machinery and Chemical Corp.) PROCESS FOR THE PRODUCTION OF CARBON DISULFIDE. U. S. 2,661,267 (1953) December 1.

Improvement of the process for producing CS_2 by reaction of hydrocarbon gases with sulfur on a catalyst is described. Cracking of propane and higher molecular weight homologs in the presence of sulfur with production of sulfur-containing tars and coke is avoided by separately preheating hydrocarbon gas and sulfur and avoiding admixture of the reactants until a point adjacent to contact with or until actual contact with the catalyst. This is based on the finding that sulfur tends to catalyze the cracking and/or polymerization of preheated hydrocarbons not in contact with the carbon disulfide-forming catalyst, and which are at or near cracking temperature. D. M. Mason

Owen, A. J., Sykes, K. W., Thomas, D. J. and White, P. THE REACTIONS OF CARBON WITH SULPHUR COMPOUNDS. PART II. THE REACTION OF HYDROGEN SULPHIDE WITH VARIOUS TYPES OF CARBON. *Faraday Soc. Trans.* (British), 49, 1198-1206 (1953) October.

The reaction of H_2S with coconut charcoal was studied using a flow system. The reaction was appreciable at 1000° K and reached equilibrium at 1200° K. Further increase in temperature resulted in deviation from equilibrium due to the increased prominence of the reverse reaction. Reactusty of other types of carbon was a function of their surface area but by going to a higher temperature, a low surface carbon may yield just as much product as to a high surface carbon subjected to a lower temperature. These results show diffusions to be effective at the higher temperatures. S. Mori

Owen, A. J., Sykes, K. W., and Thomas, D. J. THE REACTIONS OF CARBON WITH SULPHUR COMPOUNDS. PART III. — THE OXYGEN + HYDROGEN SULPHIDE + CARBON REACTION: AN EXOTHERMIC

SYNTHESIS OF CARBON DISULPHIDE. *Faraday Soc. Trans.* (British), **49**, 1207-1212 (1953) October.

In the synthesis of CS_2 from C and H_2S oxygen was added to supply the required heat to sustain the reaction. Results indicate an increase in side products COS, and S_2, and a decrease in CS_2 at 1200° K, while at 1400° K the latter remains relatively constant when O_2 concentration is increased. Coke may replace charcoal as the source of carbon provided a higher temperature of reaction is maintained in order to get comparable yields. S. Mori

Ethane Chemicals

Weber, G. HUGE PETROCHEM PLANT DEDICATED. *Oil Gas J.*, **52**, 48, 49 (1953) November 23.

National Petro-Chemicals Tuscola project will increase the U.S. synthetic ethyl alcohol output by 20 per cent. Ethane, currently the sole petrochemical building block utilized, is recovered in the world's second largest gas extraction plant. The ethane is cracked to ethylene and hydrogen, from which ethyl chloride, ethyl alcohol, and ethyl ester are presently made; and ammonia and polyethylene plants are planned or being built. B. E. Eakin

Synthesis Processes

Scharmann, W. G. (assigned to Standard Oil Development Co.) HYDROCARBON SYNTHESIS. U. S. 2,662,090 (1953) December 8.

Synthesis gas is converted to high-olefin liquid hydrocarbons by reacting synthesis gas with a Co-Fe catalyst at 75 psig and 450°F.
G. V. Vosseller

10. CHEMICAL ENGINEERING

Batch Weighing

McKinney, A. H. BATCH WEIGHING FOR PROCESS CONTROL. *Mech. Engrg.*, **75**, 975-978 (1953) December.

A batch weighing process control system is examined with the aid of a diagram and tables. Satisfactory operation after 35,000 cycles is reported. W. J. Pleticka

Design of Experiments

Brownlee, K. A. EXPERIMENTS WITH MANY FACTORS. *Chem. Eng. Progress*, **49**, 617-621 (1953) November.

An explanation is given of the method of reducing data obtained by multiple factor experiments in order to determine the effect of each variable on the end product. It is possible to devise an experimental procedure requiring a minimum of experimental tests to completely define the effect of each variable: with eight factors, requiring 256 runs for a full replicate, a certain set of sixty-four can be chosen to give a relatively unambiguous experiment. This allows the same results to be obtained with a minimum of experimental data. B. E. Eakin

Youden, W. J. and Connor, W. S. MAKING ONE MEASUREMENT DO THE WORK OF TWO. *Chem. Eng. Progress*, **49**, 549-552 (1953) October.

A presentation of the mathematical reduction of data in order to determine the effect of one variable on others when the variables are tested in groups or combinations simultaneously. When the schedule possesses a balanced symmetry, the arithmetical operations for adjusting the observations become simple and easy. This paper presents some schedules for the selection of test samples for remeasurement.
B. E. Eakin

Heat Transfer

Eckert, E. R., Diaguila, A. J., and Curren, A. N. Nat. Adv. Comm. Aero. Tech. Note 2974 (1953).

Heat transfer coefficients were measured in a vertical tube with a length-to-diameter ratio of 5. The tube walls were heated and flow induced both up and down the tube. The investigation revealed that the total flow regime, as characterized by its Reynolds and Grashof numbers, can be subdivided into a forced-flow regime, and a mixed-free and forced-convection regime. The results are presented as film coefficients based on the inside area of the tube. R. E. Peck

Ramey, H. J., Henderson, J. B. and Smith, J. M. HEAT TRANSFER COEFFICIENTS FOR GASES: EFFECT OF TEMPERATURE LEVEL AND RADIATION. Preprint No. 10

Am. Inst. Chem. Engrs. St. Louis, Mo. (1953) December 13-16.

Between the gas temperature range of 500° to 1200° F. a small effect of temperature level on convection heat-transfer coefficients is found for cooling steam and air-flowing inside a 2-in. pipe, at Reynolds numbers of 2,000 to 20,000 for air and 5,000 to 60,000 for steam. Results also indicate that radiation contribution is in good agreement with data in the literature. S. Hu

Mass Transfer

Chu, J. C., Forgrieve, J. and Papacosta, G. C. MASS TRANSFER STUDY OF BUBBLING IN RELATION TO DISTILLATION AND GAS ABSORPTION. Amer. Inst. Chem. Eng. Preprint No. 22 (1953) December 13-16.

Mass transfer coefficients were measured for distillation of acetone and water in a 4″ diameter tower. The results are presented as "j_D" as a function of the Reynolds and Schmidt numbeds. It is concluded that a substantial part of the mass transfer occurred in the bubble formation region. R. E. Peck

Mixing

Blumberg, R. and Maritz, J. S. MIXING OF SOLID PARTICLES. *Chem. Eng. Science* (British), 2, 240-246 (1953) December.

The theory of complete and incomplete mixing is discussed and a definition for complete mixing is proposed using a statistical hypothesis as the test criterion. It is shown that a small number of samples examined statistically is sufficient to indicate completeness of mixing at any time during the mixing process. D. J. Dennison

Oxygen Manufacture

Sherwood, P. W. TONNAGE OXYGEN. *Petroleum Refiner*, 32, 93-96 (1953) December.

The principles of air separation by refrigeration and rectification are discussed including a consideration of the compound distillation column and the Linde double column. Methods of refrigeration include low pressure vaporization, cooling by the Joule-Thomson effect and by expansion through a turbine.

C. G. von Fredersdorff

Precipitator Efficiency

Walker, E. A. and Coolidge, J. E. SEMIEMPIRICAL EQUATION OF ELECTROSTATIC PRECIPITATION. *Ind. Eng. Chem.*, 45, 2417-22 (1953) November.

A conclusion is developed for the efficiency of electrostatic precipitators which involves the corona voltage, precipitator length, gas stream velocity and humidity of the gas stream. Results are still highly empirical and do not cover a very wide range of industrial applications.

W. G. Bair

Rate Data

Davis, D. S. A NEW EQUATION FOR S-SHAPED CURVES. *Chem. Processing*, 16, 194, 196 and 198 (1953) December.

Data which plot as S-shaped curves on rectangular coordinates (such as cumulative products = x, vs particle size = y) can frequently be rectified by an equation of the form

$$\phi = \frac{x - x_1}{a + bx} = \log \frac{20y}{\log\ (100 - y)}$$

where x and y are the variables and a and b are constant. Tabulated values of the function ϕ are given, including an example of use.

C. G. von Fredersdorff

Salt Heat-Exchangers

Uhl, V. W. HEATING UNITS FOR MOLTEN SALT HEAT-TRANSFER MEDIA. *Chem. Eng. Costs Quarterly*, 3, 111-122 (1953) October.

Heat transfer data are presented for heat exchangers which have molten salt as the heating media. The results are correlated in terms of the physical properties of the salt and the dimensions of the exchanger. Cost and efficiency data are also presented. R. E. Peck

Spray Nozzles

Doumas, M. and Laster, R. LIQUID-FILM PROPERTIES FOR CENTRIFUGAL SPRAY NOZZLES. *Chem. Eng. Progress*, 49, 518-526 (1953) October.

The behavior of centrifugal spray nozzles were studied experimentally using the theoretical analysis of Novikov as a basis. A solution was obtained for predicting flow rates, spray angle, aircone radius, film thickness, and drop velocity from the physical dimensions of the nozzles. Sample calculations were given. S. Hu

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Conductivity of Insulators

Mischke, C. R. and Farber, E. A. AN ACCURATE METHOD FOR THE DETERMINATION OF THE THERMAL CONDUCTIVITY OF INSULATING SOLIDS. Amer. Soc. Mech. Eng. Paper No. 53—A185 (1953) November-December.

An improved guard-ring hot plate for the determination of thermal conductivity of insulating solids. Thermal conductivity data are presented for glass, masonite and transite vs. temperature. The results indicate nonlinearity of thermal conductivity of some substances.

G. V. Vosseller

Contactor

Ng, T. (assigned to Standard Oil Development Co.) APPARATUS FOR COUNTERCURRENT CONTACT OF FLUID MATERIALS. U. S. 2,665,975 (1954) January 12.

An apparatus for the counter-current contacting of immiscible liquid-liquid systems of different specific gravities or liquid-gas systems.

G. V. Vosseller

Dust Collectors

Dallavalle, J. M. HOW TO ESTIMATE DUST COLLECTOR COSTS. *Chem. Eng.*, **60**, 177-183 (1953) November.

The increasingly strict regulation of atmospheric pollution by industrial dust is resulting in an increased interest in dust collectors. Presented here are cost, selection, and operating and maintenance information for various types of applications. All of the general types of dust removers are discussed. B. E. Eakin

Expansion Joints

Dahl, N. C. TOROIDAL-SHELL EXPANSION JOINTS. *J. Appl. Mech.*, **20**, 497-503 (1953) December.

Experimental data on stress and axial deformation developed in a toroidal shell expansion joint compare favorably with the values predicted from theory. C. G. von Fredersdorff

Gas Flow Meters

Oppenheim, A. K. and Chilton, E. G. PULSATING-FLOW MEASUREMENT—A LITERATURE SURVEY. Amer. Soc. Mech. Engr., Paper No. 53—A157 (1953) November-December.

Technical publications on the measurement of pulsating flow are reviewed. Fundamental aspects of the subject are stressed, and applications of pressure-differential meters are emphasized because of their importance to industry. Problems related to these meters are classified into those concerned with flow through the meter test section, the effect of the flow system on the meter, and the transmission of the signal from meter to recorder. Operation and application to pulsating flow of other meters such as the turbine type and electromagnetic flowmeter, the hot-wire anemometer, and the so-called "true mass-rate flowmeter" also are outlined. A summary of information available in codes and manuals is included. Authors' Abstract

Wallick, G. C. THE STEADY-STATE FLOW OF GAS THROUGH GLASS CAPILLARY TUBES. *J. Petroleum Techn.*, **5**, 20-23 (1953) November.

This paper describes experimental procedures for the calibration of capillary tubes to be employed as comparison standards in gas flow-rate measurements and considers several types of flow which were observed in the calibration of seven capillaries of varying diameter. It is shown that under certain experimental conditions deviations from Poiseuille flow are observed which may not be attributed to turbulence, and that this flow behavior may be described empirically by introducing the classical kinetic energy correction into the Poiseuille equation. Author's Abstract

Sonic Viscometer

Roth, W. RHEOLOGY OF FLUIDS. *Instruments*, **26**, 1710, 44, 45, (1953) November.

An instrument has been developed to measure viscosity of fluids. The instrument uses high frequency (ultrasonic) waves to measure the viscosity of Newtonian liquids. It may be used on non-Newtonian fluids, and in that case, gives an apparent viscosity which is a function of the frequency of the system.

R. E. Peck

12. MATERIALS OF CONSTRUCTION

Cathodic Protection

Mudd, O. C. NEW TECHNIQUES AND CURRENT PROBLEMS IN CONTROL OF UNDERGROUND CORROSION. *Gas Age*, **112**, 46-51, 77-78, (1953) December 17.

Many useful ideas on electrical ground beds and electrical current drainage bonds used in connection with cathodic protextion of underground pipelines are presented. A rather complete discussion also is given of pipeline coatings and practices recommended for protecting the coating from mechanical damage during pipeline construction. H. C. Owen

Van Nouhuys, H. C. CATHODIC PROTECTION AND HIGH RESISTIVITY SOIL. *Corrosion*, **9**, 448-459 (1953) December.

This paper deals with the design, installation, and economic aspects of cathodic protection for the 350 miles of bare 8-in. pipe used by Southeastern Pipe Line Company to transport refined products from Port St. Joe, Florida to Atlanta, Ga. Twenty-five rectifiers are used to lower the pipe-to-soil potential of the entire line a minimum of 0.3 volt measured to a remote electrode. Although the soil resistivity is quite high, varying from 20,000 to 1,000,000 ohm-cm at pipe depths, leaks occurred before the present cathodic protection program was adopted. As further leaks are discovered, it is planned either to increase the size of the rectifiers or to add other units between the present one. It is estimated that the average total cost of this cathodic protection system is about $85 per mile per year. Finally a comparative test is described between magnesium ribbon anodes and rectifiers in another section of the line where the soil also had a high resistivity. The cost of annually checking the installation with magnesium ribbon to determine if it were operating properly was considered to outweigh its near-ideal distribution characteristic.
H. C. Owen

Coatings

Cavallier, J. A. (assigned to Société: Pompes Noel, Liverdun) COATED PIPE. U. S. 2,656,857 (1953) October 27.

A coating composition and process of application are claimed for protection of threaded-end pipe. After coating by soaking the pipe at 110° to 130°C. in a 60% pitch: 40% solvent oil bath, the pipe is cooled slowly so that the threaded portion of the coat contains 10% more of the oil than the body coat, thereby giving a lubricating, sealing and continuous protective coating when the joint is made.
O. P. Brysch

Corrosion

WHAT DOES CORROSION COST YOU? *Petroleum Processing*, **8**, 1685-88 (1953) November.

Based on a nationwide survey of oil refineries, direct corrosion costs were estimated at 9 cents per barrel of crude processed. Indirect costs for corrosion are estimated to be about equal to direct costs. G. V. Vosseller

Paints

Jones, L. G. PLAN PROTECTIVE PAINTING TO REDUCE ELECTROLYTIC CORROSION. *Power Eng.*, **57**, 82, 83 (1953) December.

Some practical aspects of the complicated subject of galvanic corrosion as it affects average plant operations are presented, also factors influencing galvanic corrosion are discussed. The means that might be used in conjunction with paints to minimize galvanic corrosion are summarized. S. Volchko

Plastic Pipe

NEW ALL-PLASTIC PIPE LINE HANDLES MONTANA CRUDE. *Oil Gas J.*, **52**, 72-73 (1953) November 23.

A nine-mile long plastic line was completed in Poplar, Mont. The pipe is 3 in. inside diam. with a 1/8-in. wall thickness extruded from 100 percent pure cellulose acetate butyrate plastic. The line was designed to operate at a maximum pressure of 90 psi. at a temperature of 60°F. Installation costs were a fraction of those which would have been required for a steel pipe. The line has proved to be free from paraffin clogging and corrosion both of which plagued the steel pipe it replaced.
G. Engholm

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Chemical Week
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Coal Heat
Coke and Gas
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Compressed Air
Construction Methods and Equipment
Corrosion
Current Chemical Papers (Chem. Soc., London)

Electronics
Endeavour
Engineers' Digest
Erdöl und Kohle

Faraday Society. Transactions
Fuel
Fuel Abstracts
Fuel Economist
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Gas Council Publications
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Independent Petroleum Association of America Monthly
Industrial and Engineering Chemistry
Industrial Finishing
Industrial Gas (American)
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Institute of Fuel (British). Journal
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Institute of Gas Technology Publications
Institution of Gas Engineers. Bulletins, Communications and Transactions
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National Advisory Committee for Aeronautics, Reports
National Fire Protection Association Quarterly
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Nucleonics

Official Gazette of the U.S. Patent Office
Oil and Gas Journal
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